

Status Report from WFIRST SDT Galactic Plane and General Observer Task Group

WFIRST SDT Meeting #3
2011 April 14

Charter

- **PRIMARY:** Produce a "reference" Galactic plane and general observer program for the JDEM-Omega telescope design. As specified by the NWNH EOS panel, the program is to be carried out over 20% of a five year mission. If a consensus cannot be reached, task-group members may submit minority reports with alternative programs.
- **SECONDARY:** Suggest changes to the JDEM-Omega design that would produce either improved science at the same cost as JDEM-Omega or the same science at a lower cost.
- **DEADLINE:** 2011 May 31.

Membership

- Kem Cook (LLNL)
 - Megan Donahue (MSU; member SDT)
 - Lynne Hillenbrand (Caltech)
 - Daniel Stern (JPL/Caltech; member SDT) - chair
 - Roeland van der Marel (STScI)
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- Project Contacts:
 - Sean Carey (SSC)
 - Neil Gehrels (GSFC)
 - John Stauffer (SSC)

Key Quotes from NWNH

pg. 206: “WFIRST will also offer a guest investigator program supporting both key projects and archival studies to address a broad range of astrophysical research topics.”

pg. 207: “The committee considers the general investigator program to be an essential element of the mission, but firmly believes it should not drive the mission hardware design or implementation cost.”

Key Quotes from EOS Panel Report

pg. 6-8: “WFIRST will also carry-out near-IR surveys of extensive areas of the sky, including the plane of the Milky Way galaxy, and support “guest observer” programs of *pointed* observations.”

pg. 6-12: “A significant fraction of the first 5 years will also be used for surveys and smaller peer-reviewed guest-observer projects that will investigate, for example, galaxy evolution, stellar populations of nearby galaxies, and the plane of the Milky Way galaxy. ... As the mission unfolds ... “Guest Observer” programs will assume more importance. ... By combining this double core focus with a broad vision that addresses the diverse and changing research priorities of astrophysics, *WFIRST will serve as a dedicated facility and a broader-use observatory.*”

Key Quotes from EOS Panel Report

pg. 6-17: “As a **strawman** example of how the first 5 years of a 10-year mission might be allocated, the panel imagines 2+ years dedicated to the cosmic acceleration program. ... Dedicated microlensing campaigns of 100-days in each of the 5 years could accumulate a significant sample, even within the first few years of the mission. **A Galactic plane survey of one-half year, together with about 1 year allocated by open competition, would fill the initial 5 year timeline.** Barring any operational problems, WFIRST should continue for another 5 years: peer review would compete augmentations of the cosmic acceleration or planet survey programs with new or larger surveys and smaller GO programs. ... It has not been the panel’s intention here to be overly prescriptive, just to show how WFIRST might accomplish all that is envisioned.”

Schedule of Telecons

- task group composition set on March 26
- had telecons on 4/1 and 4/13:
 - discussed status/plans of WFIRST/JDEM-Omega
 - reviewed charter for our task group
 - began discussion of Galactic plane survey: e.g., science, depths
 - looked carefully at Ferguson White Paper: *“The Scientific Opportunities of a General Astrophysics Program Associated with a Dark Energy Mission”*
- have set aside a weekly slot when all key members are available; planning on weekly telecon for next few weeks.

Galactic Plane Survey

- General notes/comments:
 - Depth of Galactic plane survey will be driven by the confusion limit, which is a non-trivial calculation. Sean Carey has begun work; very quick & dirty estimate is that WFIRST would reach ~ 3 mag deeper than 2MASS and ~ 1.5 mag deeper than UKIDSS.
 - Scoping out how much could be done in a 6 month survey. Quick & dirty estimate is that WFIRST could cover the Spitzer GLIMPSE survey ($360^\circ \times 2^\circ$) in ~ 1 month, implying a 6 month survey could cover to higher Galactic latitudes.
 - Need to identify what is WFIRST-unique science (e.g., not UKIDSS, etc...)
 - Grism is unlikely to be useful for Galactic survey (at least in the more confused areas).

Galactic Plane Survey

- We have started brainstorming Galactic survey science cases. Working to prioritize these, and then will flesh out a subset. Examples include:
 - Galactic structure from red tracers (e.g., AGB stars, carbon stars, red clump giant stars, perhaps WR stars); where is the edge of the Galactic disk?
 - Map the disk warp: what is its shape and extent?
 - Map the Galactic bar: what is its shape, length and orientation?
 - Galactic satellites / tidal streams: find and characterize stellar pop's
 - Deep extinction maps?
 - Uniform star cluster census; SFR and IMFs through the disk
 - Sub-solar mass T Tauri stars and protostars to ~ 15 kpc
 - Coolest BDs / free-floating planets: IMF, scale-height
 - Coolest WDs: history of Milky Way star formation
 - Variable stars; e.g., Cepheids as distance measure
 - Proper motions for red objects

Guest Observer Program

- We have started brainstorming a broad set of possible GO programs. Working to prioritize these, and then will flesh out a subset. Examples include:

- Solar System trans-Neptunian object survey
- ultracool dwarf census (e.g., in Galactic clusters)
- proper motion / parallax survey - e.g., for (known) brown dwarfs
- transiting exoplanets
- Andromeda / LMC / SMC surveys
- resolved stellar populations in nearby galaxies beyond the Local Group
- tiered extragalactic surveys (between HLS and SN survey)
- galaxy clusters
- dark energy and microlensing GO programs?

General Points

- An ETC would be very beneficial to our task group.
- Even if Galactic survey and GO programs don't drive mission design, having these programs as significant goals of the overall mission does have some implications for the mission design which are best addressed early (e.g., how to schedule WFIRST, how to archive and release data, etc...).
- For now, we're not considering additional filters. Should we?